

Stroke Committee
November 18, 2006

1. Call to Order/Roll Call/Approval of Minutes
 - A) Dr. Neal Rutledge, Stroke Committee Chair, called the meeting to order on November 18th, 2006 at 1020.
 - B) Anne Leonard performed the roll call with the following members present: Joe Anzaldua, Lee Buono, Mike Click, Lester Collins, Liana Dawson, Shirley DeBell, Raymond Fowler, Janss Williams, Anne Leonard, Khalid Malik, Michael Mohan, Victoria Prada, Neal Rutledge.
Members Absent: Tim Berry, Brent Dalley, James Grotta, Kimberly Lawson, David Sherman.
 - C) Minutes were approved from the prior meeting held on August 9, 2006.
2. Steve Janda made several announcements.
 - A) The Texas Open Meetings Training is due January 1, 2007 and is required by all committee members.
 - B) GETAC meetings for 2007 are presently scheduled for:
February 21-23, 2007 – Crown Plaza Hotel
May 23-25, 2007 – Austin Airport Hilton Hotel
August 22-24, 2007 – Austin Airport Hilton Hotel
November 17-19, 2007 – Houston Texas (Sat., Sun., and Mon.)
3. A) Neal Rutledge wanted the committee to address comments by the public. A note of the committee's action will be listed at the end of each area of public comment. These comments were solicited via communications from postings on the GETAC website.

1) I have a concern about the recommendations made by the GETAC committee of automatically triaging all stroke patients to the highest level of care if within a 15 minute time frame. Not all stroke patients are needing neurointerventional procedures, and there are limited facilities that provide neurointerventional or Comprehensive care. If a primary stroke center has the capability to administer IV tPA (which they should), sending the patient to a CSC because it is a higher level of care wastes needed time and the CSCs stay "out of Practice" or do not maintain competency in the process of timely administration of IV tPA.

There was some discussion by the committee to reconsider the 15 minutes diversion time frame. Dr. Dawson motioned to make no change to this comment. The motion passed by the committee. No change will occur as a result of the comment.

2) According to The BAC recommendations, Research is considered an optional component of a CSC: "A hospital can clearly provide excellent care as a CSC and not be involved in any research. Therefore research is considered an optional component of a CSC" Therefore, I would suggest that the criteria for Texas stroke CSC be changed from: f. Educational and **research programs** to f. Educational and **Expert resources**

The committee discussed changing the word research to expert resources. Lester Collins made the motion to delete "research" from the wording of the last sentence, to "expert resources"/

3) To go along with the BAC recommendations and the fact that JCAHO is not going to provide certification for CSCs in the future, I would like to recommend that there be a component in the

list of criteria for CSC that includes outcomes and quality improvement plan ie (per BAC): pg 1608 under OTHER:1 .multidisciplinary QA committee meeting on a regular basis to monitor benchmarks and review complications 2. monitoring the outcomes of procedures performed 3. Data base registry for: LOS, treatment received, DC destination/status, incidence of complications (DVT, aspiration pneumonia, UTI)

The committee did not address this comment, as the committee thought that there was a misunderstanding by the commentor. No action was taken by the committee.

4) Attached are the draft document sent out on 9/29/06 by Mr. Steve Janda. The documents were discussed in our RAC meeting last PM and some of the comments/concerns are added to those documents in red font. Our RAC wants to congratulate the GETAC Stroke committee on the progress they have made to date, but feel that these draft documents / rules need considerable more work. Our RAC will support your efforts to make stroke care optimal in Texas.

The committee did not address this comment, and agreed that further rules would develop as the work of the committee continues.

5) I'm very much interested in the draft document regarding early treatment protocols for rapid transport for stroke patients. Would you be addressing the criteria for implementation of air medical transfers? I am not aware of any stroke-specific criteria (modeled after the STEMI protocol) and would like to see something of this nature also developed. My institution is the flagship (comprehensive stroke center) for a system network and would utilize air medical transport. Also our community outreach activities of greater Houston area would benefit from air medical transport into the Texas Medical Center where three JCAHO primary stroke centers are located. 1.) Has the committee to develop a region-specific stroke plan been identified and in place? 2.) Would this be one committee for the state or would each region develop their own. I would be very interested in participating. 3.) What is the time-line for design and implementation of this plan? 4.) Is there a strategic plan to identify which region's plan is developed first? 5.) Is there a roll-out plan for the state? 6.) Are there any consequences for not following the plan? 7.) Who would have access to the registry?

The committee did not discuss this comment and there was no action taken by the committee. It was the committees feeling that this comment would become "RAC centric", and therefore thought no action was warranted.

6) What happens if we have a pediatric patient? Do we take them to Children's Hospital or the stroke center?

There was discussion regarding the definition of "pediatric patient". The committee defined "pediatric" as a person under the age of 18 years. The committee also discussed the issue of giving tissue plasminogen activator to children (pediatric patients). The FDA has not approved the administration of TPA to pediatric patients. If it is given, this would be "off-label". Joe Anzuldua motioned that pediatric patients be taken to a children's hospital if appropriate and Mike Click seconded the motion. The motion passed.

7) As Chair of RAC -- I have many concerns regarding the draft document presented. The RAC's original Mission was to establish a regional trauma plan for the injured patients in our RAC. The reason that I tell you that is that all the players in that organization are pre-hospital and hospital trauma care providers. It is important to remember that RAC members participate on a voluntary basis on top of their regular jobs. If I were to ask who in the RAC has an expertise in stroke care there would be few if any to raise their hand. Those players do not attend the RAC meetings. That would be our first goal before establishing. I do not feel the RAC's have the authority to categorize hospitals as stroke centers. This process would only work if it was through DSHS. There would also be many questions which would need clarification regarding the criteria. I applaud your efforts to move this project forward and the RAC's in the State will always step up

to the plate when needed. Let us not set a goal that we the RAC can not achieve. Involve us and work with us in this process and lets get the experts to the table.

It was agreed that Neal Rutledge would present recommendations from this committee to the RAC chairs and each RAC would be responsible for implementation. There was no specific changed initiated by the committee.

8) The proposed model by BAC might be more appropriate for urban areas but it is not impossible in other scenarios. The poster child for this program is for example the St. Luke Hospital in Kansas City (Mid-America Brain and Spine Center) that has developed one of the busiest and more efficient networks covers a rural area.

There area models like the one implemented by the Medical College of Georgia that is based on teleradiology which allows to solve the problem of 24/7 interpretation available in each hospital. In this program the neurologist in the stroke center even was able to received a televised exam of the patient in real time and then could make the assessment and assume the responsibility of authorizing to start the TPA administration at the referring facility or in transit.

Absolutely the patients should not be taken to local hospitals by EMS. This is a waste time particularly in rural areas. This concept is the foundation of regionalization and it has been proven to work in other rural areas of the country for trauma and stroke.

Although it is true that IV TPA is the only FDA approved treatment in acute stroke, there are plenty of other innovative treatment options developed since the approval of TPA. Much of the research in this area for the last ten years has been dedicated to extend the window of opportunity. There are multiple trials on-going and many of them are use image-base selection criteria to guide the therapy and select the patients that can be safely treated up to 24 hs. The capability of participating in these trails in San Antonio will be unique to UTSCSA.

It is true that the only 4% of the acute stroke admissions receive TPA but for this particular reason the patients should be transfered to specialized centers that can provide other treatment options accepted beyond the 3 hs. The PROACT trial (NIH funded) demonstrated the advantage of using intra-arterial TPA up to 6hs. The MERCI retrieval device has been cleared by the FDA to remove clots up to 8 hs. Ongoing trials are exploring to extend the time limits.

The question about source for financing is a reasonable concern but to argue against the value of having a registry and collecting this data is contrary to every principle of evidence based medicine. These arguments would not be valid even a decade ago, nowadays they are an anachronism.

It appears that there are some facts that need to be acknowledged and circumvent but to dismiss such a valuable project will be an awful mistake that would deprive patients in the state of Texas of the best possible medical care. Details should not jeopardize a very important undertaking to improve the healthcare in the region.

Indeed some adaptation to the particular Texas geographic reality should be considered but operational organization used for the Trauma centers could be a great example to replicate.

There was no specific change related to this comment by the committee.

9) In reviewing the draft document on "Early Treatment Protocols for Rapid Transport" I noticed that the draft recommends three levels. 2ii. gives levels 1 & 2 to comprehensive and primary Stroke Centers.

These are my recommendations:

Level I Comprehensive Stroke Center

1. Certified as a JCAHO Primary Stroke Center
2. Accomplished Phase 2 or 3 of GWTG
3. Enroll stroke survivors into Research Clinical Trials - expand the treatment hours to 9
 - a. Ischemic Stroke
 - b. Hemorrhagic Stroke
 - c. Secondary Stroke Prevention
4. Neuro Interventional Radiologist available 24/7
5. Organized Outreach education provided to community, EMS and surrounding healthcare facilities
6. Annual Neuroscience seminar

Level 2 Primary Stroke Center

1. Certified as a JCAHO Primary Stroke Center
2. Using GWTG as their stroke registry
3. Treat AIS up to 6 hours (IV & IA tPA)
4. Neuro Interventional Radiologist available 24/7
5. Offer at least one community stroke education event
6. Offer at least one EMS stroke education event

Level 3 Stroke Support Facilities

1. Participate in data collection related to stroke as part of their PI program
2. Must have transfer agreements with a Level 1 or Level 2 Stroke Center
3. Provide Stroke Education for ED staff
 - a. How to recognize an acute stroke
 - b. Exclusions/Inclusions for treating AIS with TPA
 - c. Administering tPA and associated complications
 - d. NIHSS

There was no specific change offered by the committee.

10) The document "Early Treatment Protocols for Rapid Transport" leads one to think that the RACs will be responsible for implementing the new region-specific stroke plans. But, the "Requirements for Texas Stroke Center Designations" adds valuable insight, specifically that each hospital will be responsible for showing DSHS that they meet the requirements by a signed affidavit. That information helps a lot, but do we really think that will be effective? Why should hospitals not be required to go through a survey process like the trauma centers? What will be the penalty if they falsify the affidavit (other than removal of advertising)?

No discussion on this comment, this has already been discussed.

11) Most hospitals do not have neurology or neurosurgery on-call coverage 24/7, and few emergency physicians will administer TPA alone, without appropriate specialty back-up. Transfers to another facility will delay treatment beyond the 3-hour window. Protocols to establish a "standard of care" without such back-up, and state liability protection for the physicians administering TPA in the setting of acute non-hemorrhagic stroke, according to state protocols, should be part of the package, in my opinion.

The committee felt that this was beyond the committees' purview. No action was taken on this comment.

12) Will there be criteria to stabilize and transfer for level IV's, because that's what we do now. What would be different? Will this be essential criteria for designation?

Steve Janda commented that Level IV hospitals must determine the patients they can treat vs those they cannot treat. No discussion or change by the committee.

13) The draft document needs a little work. It requires the implementation of a regional stroke plan by each RAC. That is not in the mission statements of RACs. Furthermore, RACs do not have the manpower to designate facilities. They do not currently designate trauma facilities either! The document includes patients up to 8 hours out, yet it requires no more than 15 min delay for transfer to the highest level stroke center. If the highest level center has a neuroradiologist that can affect patient care for up to 8 hours, why go to a center that can't do anything after 3 hours? These comments are meant to be constructive, and I fully agree with involvement of the RACs---up to a point.

A comment was made by a committee member that the legislature has mandated changes. There was not discussion by the committee and no action taken.

14) The document, in defining the components of a regional plan, itemizes the need to address the patient within 8 hours of the onset of signs and symptoms, with the time frame to be altered as new therapies are available. The most current treatment regimen from the American Heart Association involves the use of fibrinolytic (or "clot buster") drugs that are effective when used in patients within 3 hours of the onset of signs and symptoms. Should the consideration within the regional plan, therefore, be in addressing the patient within that time frame? Thanks for this opportunity to comment.

The committee discussed the rationale for using 8 hours, that is the use of intraarterial TPA or mechanical extraction of a clot (i.e. MERCI device). The committee had not further discussion on this public comment and no action was taken.

15) 1. The wording on instruct paramedics should be ALLOW. The paramedic should be allowed some discretion. 2. The 15 minute thing is way too short. There are cases that going to the appropriate stroke center may take more than 15 extra minutes. 3. We do not need a registry and more bureaucracy. This should not be a complicated or expensive process on an already financially burdened health care system.

The committee had no discussion and no action was taken.

16) I think the concept of stroke center designation is absolutely essential!! There are certain centers who have a neurosurgical/intensivist team of surgeons, neurologists, and neuro-radiologists who are capable of delivering state of the art stroke care....better than what we in the community can deliver. I would like everyone to consider bypassing closer hospitals in their territory to go to a stroke or tertiary care center even if the transport time exceeds 15- 20 minutes. If time is of an essence, then aeromedical transport could be indicated.

The committee had no discussion and no action was taken.

17) What good does it do to write such a statement when you have hospitals and EMS services that do not and will not comply with it.

The committee had no discussion and no action was taken.

18) When is it anticipated that JCAHO will have their review process in place for Comprehensive Stroke Center Certification? If a JCAHO Primary Stroke Center chooses to pursue Comprehensive stroke center Designation without JCAHO, is this considered a certification or designation? If indeed the criteria is already set forth by the BAC and published in the Stroke 2006 issue for Comprehensive Stroke Centers, who oversees if criteria and outcomes are indeed being followed?

The committee discussed that JCAHO will probably have guidelines and certification for Comprehensive stroke centers within the next 2 years. The committee had no further discussion and no action was taken.

19) I have one concern that keeps getting bypassed in whatever topic comes up it seems- frontier/rural ems. i am a hospital based ems-critical care access-our er has three beds-we stabilize and transport a large number of folks. we have the ability, by protocol, to transport folks from the scene directly to any hospital if necessary or requested. however, we often cannot meet timelines set by "national standard". we need the issue of not being able to meet time guidelines addressed and suggest what is the "next" best route to take...we keep hearing that since we cant transport a patient within certain guidelines, we are screwed and so is our patient. those patients and their needs must be addressed. yes, i understand all too well that their outcome may not be as "good" as someone that is 15 minutes away from a stroke center. our situation is ----- medical center-level 3, is 63 miles away. ----- level 1's, i believe, are 117 miles away. by the time we pick up a patient, bring to our hospital, stabilize, arrange transfer to one of these hospitals- WHICH TAKES UP TO A DAY FOR ACCEPTANCE (ESPECIALLY =====) OUR PATIENT IS MAKING FUNERAL ARRANGEMENTS. yes, we have helicopters all over the place-1 is 15 min out, 1 is 20 minutes out, 2 are 25 minutes out and 2 are 50 minutes out...IF THEY ARE AVAILABLE..we are making plans to simply ground everyone we can or have to, by upgrading our units to specialty care....but there is no guidelines to help us equip our trucks with needed equipment for stroke. please remember, we are small and have very limited funds to spend on such. that makes it even harder. but, there are numerous small ems services around our area that will fall between the cracks because frontier/rural ems will be forgotten in the process. i realize that we may not be the shining gem in this process and outcome but we can and want to provide care for our stroke patients just as much as ANY big city ems or hospital. i thank you for tackling this task...it is long overdue.

The committee had no discussion and no action was taken.

20) I am encouraged by the wording below. It was my greatest fear that the protocols would cause tremendous delays in care initiation by EMS staff attempting to get patients to a definitive care program. In the past I have seen great harm come to patients when delays were caused by protocols that bypassed a closer facility where it was appropriate to initiate care. "There should

be no more than a 15 minute delay caused by taking a patient to the next highest level of stroke care."

The committee had no discussion and no action was taken.

21) I think we need to be very careful with this issue. The idea of a Stroke Center revolves around the controversial issue of thrombolytics for acute cerebral infarction. Since there still remains a large amount of disagreement on this topic, I am very loath to create a standard of care by creating a system parallel to the trauma system for stroke.

The committee had no discussion and no action was taken.

22) An additional question was read by Neal Rutledge. There was public concern about insurance payment to stroke patients out of network going to designated stroke centers out of network.

The committee felt that no discussion regarding this issue could be undertaken at this time and no action was taken.

The committee had some discussion about what performance measures should be reported by stroke centers. Dr. Kalid felt that all 10 JCAHO standard performance measures should be collected. Dr. Dawson had some concerns about locking into a specific database. Dr. Kalid stated that centers should collect at least the 10 performance measures at a minimum. The cost for the AHA Get With the Guidelines is \$900.00 and for an expanded dataset the cost is \$2400.00. Anne Leonard felt that stroke centers should share ideas about data collection to mentor center along. The committee discussed that data information of interest would be EMS runs for stroke, number of admits per hospital for stroke (cases) and hospital should be collecting information on outcomes. A motion was called by Neal Rutledge.

The majority of committee members felt that all 10 standard JCAHO performance measures be collected by stroke centers.

There was a query by the public as to whether or not stroke centers should go on "diversion". Diversion was discussed by the committee and public attendees as "voluntary". After discussion a motion was made that stroke centers would follow the same rules as trauma centers. The motion was passed, and it was discussed that stroke centers should stay off of diversion if possible.

Early Treatment Protocols for Rapid Transport Subcommittee

Prior to finalizing these protocols, input from the Regional Advisory Committee ("RAC") chairs, the Governor's EMS and Trauma Advisory Council ("GETAC") medical directors subcommittee, and other interested stakeholders should be sought.

The initial concept for stroke transport has 4 components that each RAC should implement:

1. Appointment of a "stroke committee" to develop a region-specific stroke plan.
2. A region-specific stroke plan wherein;

a. hospitals in a region are categorized based on ability to provide definitive stroke diagnosis and care. With such categorization hospitals should put a premium on 24/7 availability of stroke expertise, and ability to track essential outcomes. The following plan is recommended:

- (i) There will be a 3 level categorization of hospitals/facilities.
- (ii) Levels 1 and 2 will be Comprehensive Stroke Centers ("CSCS") and Primary Stroke Centers ("PSCS") respectively, using criteria similar to those established by JCAHO and the Brain Attack Coalition.
- (iii) Level 3 facilities will be similar to those defined by the Stroke Facility Criteria subcommittee as "Support Stroke Facilities". Level 3 hospitals will be called Stroke Facilities and not centers.
- (iv) Criteria can and should be "Texas and region specific". However, existing national guidelines and credentialing systems (such as JCAHO) for primary and comprehensive stroke centers should be incorporated. Hospitals should be prohibited from claiming Stroke Center or Facility status without meeting verification guidelines. Systems for recognizing/verifying non-JCAHO credentialed Stroke Facilities must follow the Brain Attack Coalition guidelines.

3. A regional triage plan that includes the following general principles:

- a. A written plan is developed for regional triage of stroke patients to hospitals best able to care for them.
- b. Patients out to 8 hours from symptom onset. This time window can be altered as new therapies become available.
- c. Instruct paramedics to take patients to the highest level Stroke Center available within the region (or adjacent region, if a higher level Stroke Center in the adjacent region is closer than a lower level Stroke Center in the region). In making this determination, distance and time parameters should be considered. There should be no more than a 15 minute delay caused by taking a patient to the next highest level of stroke care. Where the available stroke care level and Stroke Centers/Facilities are comparable, a rotating scheme could be developed to ensure a fair distribution of patients among qualified Stroke Centers/Facilities.

4. Creation of a system to maintain a registry of the number and destination of stroke patients transported.

There was no discussion by the committee and no action taken on the Early Treatment Protocols for Rapid Transport Subcommittee as stated above.

Other Comments for the public attendees:

Ms. Beverly Walsh had several comments:

1. That many hospital don't participate in the RAC in their area.
2. There is no documentation that it is mandated that hospital participate in the RAC.
3. She felt that to be designated as a stroke center that a hospital actively participate in the RAC as defined in the RAC bylaws.
4. She also commented that there be documentation that stroke centers cannot go on diversion.
5. She felt that this requirement needs to be added as specific language for types of hospitals.

Mr. Eric Epley, Director of the STRAC made the following comments:

1. He felt that stroke centers adopt the Trauma model.
2. He felt that community education was going to be of paramount importance as to where patients with stroke will go (i.e. stroke centers).
3. He stated that the RAC's would need leadership coming from this committee.

Another comment from the Tyler RAC Chair was that any representative on a RAC stroke committee be someone who care for the stroke patient population.

The next GETAC Stroke Committee meeting will be on February 21, 2007 at 10am in Austin.

The meeting was adjourned at 1230pm.

Attachments to follow:

Revised EMS education (draft) incorporating suggestions and comments from this meeting.

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Continuing Education Module SAFD/EMS 2003

Emergency Medical Services Training for Ischemic Stroke

In SB330 enacted by our legislature in 2005, a strong system to treat stroke victims in a timely manner and to improve the overall treatment of stroke victims was ordered. Part of this act is that a stroke emergency transport plan must created and include training requirements on stroke recognition and treatment, including emergency screening procedures.

The GETAC Stroke Committee is cognizant that training and oversight of EMS personnel can be time and resource intensive, and so recommends the following minimal additions be added to Emergency Medical Service Provider's licensure detailed in the Texas Administrative Code.

- 1) That all EMS providers be trained and use the "Cincinnati Stroke Scale" in the assessment of possible stroke victims.
- 2) That all certified EMS providers receive training in the recognition and emergency care of stroke, equivalent to training received in the current "ACLS Case 10 stroke scenarios".
- 3) That EMS providers have documented familiarity with the Stroke Center Certification and the Emergency Transport Protocol in their RAC.
- 4) That recognition and documentation of stroke training be overseen by the Medical Director supervising the EMS personnel.
- 5) That current ACLS certification be recognized as documentation of that training or that alternatively the supervising Medical Director be responsible for the oversight, documentation and attestation of equivalent training on a yearly basis.

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Acute Stroke

Learning Objectives:

1. Explain why stroke is a medical emergency.
2. Describe the pathophysiology of stroke.
3. Discuss the Emergency Medical response and treatment for stroke.
4. Describe the 7 D's in the Stroke Chain of Survival. Detection, Dispatch, Delivery, Door, Data, Decision, and Drug (TPA)

- I. **Background:** Stroke is a major public health problem in the United States. Stroke is the third leading cause of death and about every minute, a person in this country has a stroke. Each year about 700,000 strokes occur in the US, 500,000 accounted as new strokes and about 200,000 recurrent strokes. It remains the leading cause of adult disability. About 150,000 American die from stroke related causes each year. Those who survive stroke may live with severe disabilities such as paralysis, loss of the ability to communicate such as loss of speech or comprehension, loss of the ability to swallow and memory lapse. The cost of stroke according to American Heart Association statistics is about 57 billion dollars each year in direct and indirect costs.

Stroke knows no ethnic, socioeconomic or racial boundaries. Stroke causes death and disability of people of all ages, both genders, and all ethnic and racial groups. Death and disability rates from stroke are higher among African-Americans and Hispanics than Caucasians. African-Americans are almost twice as likely as Caucasians to die from stroke. In Texas, Hispanic Americans are more likely to have a stroke than non-Hispanic whites. This geographically based higher rate of stroke can be linked to several factors, including:

- a. higher-than-average population of older people,
- b. higher-than-average population of African Americans
- c. dietary factors such as diet high in fat content (a high fat diet is common in the Southern US, and of course contributes to overall vascular disease)

In an area of the United States known as the "Stroke Belt" (of which east Texas is now a part of), the death rate due to stroke is more than 10% higher than it is in other parts of the country. The stroke belt includes the District of Columbia and the states of Alabama, South Carolina, Tennessee, and Virginia. It has also been recently recognized that this Stroke Belt has a "buckle" where there is an even higher incidence of death from stroke. This area includes a 153-county area that stretches from Georgia to North Carolina. It is likely that the number of strokes will increase in the future because of the epidemic of diabetes in Texas.

Most stroke patients don't seek medical help quickly enough to benefit from time-sensitive therapies such as tissue plasminogen activator, commonly known as TPA. In general, less than half of stroke patients call for medical help within 24 hours of the onset of stroke symptoms and one third don't seek help for over 2 days. As a general rule, in fact most stroke patients arrive at emergency centers by calling 911- the average time from onset of stroke to arrival at an emergency facility is 12 hours. These delays in seeking emergency care can be attributed, at least in part, to lack of awareness about the symptoms of transient ischemic attack (TIA) or stroke.

II. Pathophysiology of Stroke

Stroke can be defined as the acute onset of a focal, non-convulsive, neurological dysfunction (neurological deficit) lasting more than 24 hours, which results from injury to brain tissue caused by an interruption of cerebral blood flow. When intervening acutely, however, the 24-hour criterion for affirming the diagnosis of stroke cannot be adhered to. One must consider an ongoing ischemic deficit to be a stroke.

The basics!

- a. Brain cells can only survive about 3-4 minutes without blood and oxygen.
- b. The brain is dependent on a steady, constant supply of blood and oxygen in order for proper brain functioning to occur.
- c. The brain is unlike the heart, which can sustain itself for a longer time before cell death occurs.
- d. Time therefore, is brain!

Several processes involving the blood vessels of, or leading to, the brain can be implicated in the cause of stroke:

- 1) Disease or abnormality in the blood vessels of or leading to the brain. This includes: Atherosclerosis (build-up of fatty deposits on the inner walls of arteries, reducing blood flow and increasing the risk of a blood clot forming and partially or completely blocking blood flow), inflammation, a dissected artery, a developmental malformation, amyloid deposits (protein fibrils that can build up on the inside of the artery wall, reducing blood flow and causing risk of blockage), or an aneurysmal dilatation (an aneurysm is a distention in the artery wall where blood builds up).
- 2) Disease or abnormality originating elsewhere in the body. This occurs when an embolus (a clot) forms in the heart or some other part of the circulatory system (i.e. the large vessels of the neck – carotid arteries), and travels to and gets stuck in a blood vessel of the brain.
- 3) Rupture of a blood vessel. This can occur in the subarachnoid space (the space beneath the arachnoid membrane, which is one of the brain's three coverings) or within the brain tissue.
- 4) Inadequate blood flow in the brain. This occurs because something is preventing adequate flow of blood to the brain (narrowed arteries, increased viscosity of the blood, or pressure applied to the artery by brain tumor, displaced cerebral tissue following hemorrhage elsewhere in the brain or following head trauma, or clot that form outside the artery as a result of blood leakage elsewhere in the brain).

The Main types of Stroke are:

- 1) **Ischemic Stroke:** This is also called ischemic cerebral infarction (ischemia is when there is insufficient blood flow to brain tissue, and infarction is the resulting death of brain tissue). Ischemic stroke is caused by a sudden interruption of blood flow that deprives the brain of vital oxygen and nutrient supplies it needs to function. Approximately **85%** of all strokes are caused by ischemia. The two broad categories of ischemic stroke are thrombotic strokes and embolic strokes.
 - a. **Atherothrombotic strokes** are caused when there is clotting within a blood vessel of, or leading to, the brain. A thrombus is a blood clot which forms over an atherosclerotic plaque on the inner wall of an unhealthy flow vessel; the clot may partially or completely block the flow of blood. When this occurs in a blood vessel of, or leading to, the brain – a thrombotic stroke – parts of the brain will suddenly be deprived of blood, oxygen and the nutrients they need to function normally. Cerebral thrombosis commonly occurs in individuals over the age of 50, and its risk usually increases with age.
 - b. Cardioembolic strokes are caused by blood clots developed in the heart that travel from the heart to the brain causing a stroke. The most common cause of cardioembolic stroke is non-valvular atrial fibrillation. These strokes are a little less common than thrombotic strokes. Other causes of cardioembolic stroke are myocardial infarction and prosthetic heart valves. This blocking of a blood vessel in the brain by an embolus causes a sudden deprivation of blood and oxygen and nutrients that the brain needs to function normally. Cardioembolic strokes occur abruptly, without warning. Their symptoms can be fluctuating, which may be due to the continuing movement of an embolus within a blood vessel of, or leading to, the brain.
 - c. Small vessel strokes or also called “lacunar” strokes are caused by disease of the small vessels deep within the inner part of the brain. The most common cause of subcortical strokes is hypertension and diabetes. These strokes are very common in the Hispanic population. The recurrence rate of these strokes is very high. Multiple subcortical strokes can cause cognitive problems. These strokes also occur at younger ages than atherothrombotic or cardioembolic strokes.
- 2) **Hemorrhagic Stroke**, also called cerebral (hemorrhage is when blood escapes from a ruptured blood vessel), damages the brain by compressing the tissue directly surrounding the hemorrhagic site. Approximately **15%** of all strokes are hemorrhagic strokes. The two types of hemorrhagic stroke are **subarachnoid hemorrhage** (caused by a ruptured blood vessel in the subarachnoid space, most commonly due to aneurysm) and **intracerebral hemorrhage** (caused by a ruptured vessel inside the brain itself, most commonly caused by uncontrolled hypertension). Hemorrhagic stroke, the most dramatic form of stroke, appears abruptly and its symptoms quickly worsen as the

hematoma enlarges and brain tissue is affected. Hemorrhagic stroke can be immediately life-threatening. Hemorrhage inside the brain often tears and separates normal brain tissue. The release of blood into the cavities within the brain that contain cerebrospinal fluid may paralyze vital centers.

- 3) **Transient Ischemic Attack (TIA) or “Mini Strokes”** are ischemic events that share the same symptoms with ischemic stroke. The symptoms of TIA however are transient-lasting from a few minutes (usually less than 1 hour) to up to 24 hours. TIAs are often ignored by patients because the symptoms tend to go away. It is important to note, however, that while symptoms are present, it is not possible to distinguish a TIA from a stroke. As such, all patients experiencing any acute ischemic event should be managed as a possible stroke patient. Moreover, even if symptoms are identified as due to TIA, they are a clear warning sign that an ischemic stroke is likely to occur in the near, possibly very near, future. Up to one third of individuals who experience TIA's will suffer a stroke within the 5 year period following their first TIA. In up to 75% of patients who develop thrombotic strokes, there is a history of previous TIAs. In addition, what may seem like a TIA (because symptoms are fluctuating) may, in fact, already be a full-blown ischemic stroke. TIA should be considered urgent and EMS personnel should highly encourage patients to seek treatment immediately.

III. Risk factors for stroke – it is important to note that patient's with the following risk factors are more likely to experience a stroke.

- 1) **Hypertension** or High blood pressure – the number one cause of stroke. Many people do not know they have hypertension.
- 2) **Diabetes** – causes small vessel disease and because high blood glucose levels increase the severity and extent of brain damage due to stroke. This is a major health problem amongst Hispanics in Texas and a major contributor to cause of stroke.
- 3) **Cigarette smoking** – which contributes to atherosclerosis in the carotid artery (the main artery supplying blood to the brain). This condition involves the buildup of fatty deposits on the inner walls of arteries, slowing down blood flow and providing prime spots for clots to partially or completely block blood flow to the brain.
- 4) **Cardiovascular disease** – in all its forms, especially atherosclerosis causing myocardial infarction, atrial fibrillation (rapid, irregular heartbeat), and rheumatic heart disease.
- 5) **Transient Ischemic Attack (TIA)** – a focal neurologic deficit lasting less than 24 hours (usually these symptoms last only about 5-10 minutes). TIA is a clear warning of potential ischemic stroke.
- 6) **Age** – the older the person the higher the chance of having a stroke especially with any of the above risk factors.
- 7) **Gender** – men have a higher rate of stroke, but older women die of stroke more frequently.
- 8) **Race** – African-Americans have the highest risk, but Hispanic rates of stroke are growing due to the high prevalence of diabetes and hypertension (especially in Texas).

- 9) **Prior stroke** – persons with a previous stroke have a higher risk of having another stroke. Patients experiencing previous stroke should be careful to practice secondary prevention modalities.
- 10) **Illicit drug use** - cocaine use is a common cause of stroke in younger people.
- 11) **Alcohol addiction or abuse** - can cause hemorrhage.

IV. Signs and Symptoms of TIA and Stroke

When every second counts, it is imperative that EMS personnel quickly recognize the symptoms of stroke is essential. Sudden interruption of blood flow deprives the brain of the oxygen and nutrients it needs to function normally. TIA and ischemic stroke cause immediate and distinctive focal neurological deficits. The particular symptoms of a stroke differ according to the precise location of the ischemia or hemorrhage.

When symptoms are experienced for only a brief period of time (minutes to hours) before disappearing, a diagnosis of TIA should be considered, but the possibility of an ischemic stroke should not be overlooked without a thorough medical examination. TIAs are a stroke 'Warning' of future stroke, and indicate the need for immediate medical attention. Symptoms of stroke may be fluctuating. Such strokes may be taking a "fluctuating progressive" course and should not be treated with any less urgency than strokes that present with non-fluctuating symptoms. As noted earlier, while symptoms are present, it is not possible to distinguish a TIA from a stroke. Consequently, individuals experiencing any brain ischemic deficit should be considered stroke patients and managed with appropriate urgency.

The most common signs and symptoms of stroke occur suddenly and may include:

- Weakness or paralysis of the face (called a facial droop), arms or leg, most commonly on one side of the body (called hemiparesis).
- Inability to speak or understand what is being said (aphasia), or slurred speech (dysarthria)
- Numbness – some persons with stroke may experience only unilateral (one side) sensory symptoms affecting half of the body.
- Visual loss in one half (or one quarter) of space, or dimming or loss of vision (especially in only one eye), constricted pupils, pupils unequal in size or reactivity, double vision.
- Severe headache with no apparent cause, often accompanied by a stiff neck. This is the most common sign of subarachnoid hemorrhage. Patients often describe this as the "Worst headache of my life".
- Dizziness, confusion, unsteadiness, or falls with no apparent cause; seizures
- Drowsiness or decreased consciousness
- Other symptoms, such as nausea or vomiting, respiratory distress, unusually flushed or pale skin, loss of bowel and/or bladder control.

V. Evaluating Risk factors, symptoms and physical features of stroke

In assessing a potential stroke, risk factors may provide clues to the types of stroke. Certain symptoms and combinations of clinical signs can also help distinguish among various types of stroke and can indicate the stroke lesion location and severity.

Age affects the probability of certain types of stroke subtypes occurring. Hemorrhagic strokes account for half of all strokes in younger people (who are at greater risk for congenital aneurysms) and only about 25% of strokes in older people. Young people with sickle cell disease are a high risk for ischemic stroke.

The assessment of level of consciousness, which is an important predictor of short-term survival, can be valuable in distinguishing the type of stroke. A patient with ischemic stroke may be drowsy, but will probably not lose consciousness unless the area of infarct is substantial, and a patient with hemorrhagic stroke is prone to lose consciousness or be semiconscious. This most critical stroke patient is the one who loses consciousness completely or becomes flaccid on the affected side of the body. The Glasgow Coma scale is a useful tool in determining level of consciousness in the field.

Headache may differentiate hemorrhagic stroke from ischemic stroke. Sudden excruciating pain, typically described by the patient as the worst headache in their life, is the classic sign of subarachnoid hemorrhage. Resultant increases in intracranial pressure (ICP) commonly trigger nausea, vomiting and/or loss of consciousness. Other signs associated with subarachnoid hemorrhage include stiff neck and photophobia. Although migraines can involve pain that can mimic subarachnoid hemorrhage, migraine headaches appear less abruptly, and often with a characteristic aura.

Gaze deviation can also help to localize a stroke lesion. In a stroke in the right hemisphere, the eyes will look toward the affected side, in this case the right side or toward the "lesion". The opposite would be true for a left hemispheric stroke; the patient would gaze to the left.

Aphasia may present with either ischemic or hemorrhagic stroke, it is characteristic of left hemispheric lesions of any size. This is because in most people, the speech and language center is located on the left side of the brain. It is unlikely that a person who can understand, remember and respond verbally has significant aphasia. Aphasia should not, however, be mistaken for unresponsiveness, the patient may be responsive to nonverbal stimuli, but unable to comprehend words.

Certain concurrent clinical signs can indicate lesion location.

- A left hemispheric stroke consists of affected movement, sensation, and vision on the right side of the body, as well as language and speech.
- A right hemispheric stroke consists of affected movement, sensation, and vision on the left side of the body, as well as spatial relationships and emotional aspects of language.
- A large area of cerebral infarction or a smaller lesion in the white matter (subcortical area) or the upper brainstem can result in impaired motor function a large region of the body (paralysis of the face, arm and leg on one side, or complete hemiparesis).

Lesions in the posterior brain (occipital lobe, cerebellum or brainstem) can result in double vision, slurred speech, severe imbalance (ataxia), and decreased level of consciousness, including coma.

IV. Overview of EMS actions in case of Acute Stroke

Critical Actions of EMS/ACLS providers in the prehospital setting

1. recognize the signs of TIA and stroke
2. Perform a rapid neurologic exam that includes the elements of the Cincinnati Prehospital Stroke Scale and the Los Angeles Prehospital Stroke Screen.
3. Determine (if possible) the time of the symptom onset.
4. Provide rapid transport to an ED capable of caring for patients with acute ischemic stroke, preferably a stroke center.
5. Assess and support cardiorespiratory function as necessary during transport. Practice the ABC's.
6. Perform finger-stick determination (if a part of individual protocols) of serum glucose levels and treat appropriately.
7. Notify the receiving hospital early that a possible stroke victim is in transport. Always convey the time of stroke symptoms onset.

Inappropriate Actions of EMS/ACLS providers in the prehospital setting

1. Failure to evaluate the patient properly or to recognize the signs and symptoms of stroke.
2. Delay in transporting to the ED or transporting to an ED not capable of treating the patient appropriately. Practice a "load-and-go" philosophy.
3. Attempting to treat hypertension in the field. Never treat hypertension in the field.

It is important to stress that the objective is to rapidly assess, stabilize and support the stroke patient and transport him or her to an appropriate facility that can take care of stroke patients. Remember: **TIME IS BRAIN!** During stroke, brain tissue in the immediate area (called the infarct) die relatively quickly. When they die, these cells set off a "chain reaction" of chemical and electrical events within the brain that imperils a much larger, surrounding area of tissue (called the ischemic penumbra) in the hour immediately following the stroke. Every minute that passes during stroke affects the ability of compromised brain cells to recover and function normally. Treatment with tissue plasminogen activator (TPA) must begin within 3 hours of the onset of stroke symptoms. TPA can be considered a brain resuscitation or rescue therapy, targeting the brain cells of the ischemic penumbra. Recanalization of vessels around the ischemic penumbra can keep blood perfusing thus limiting brain cell death. In some hospitals in Texas have ongoing experimental or research protocols, looking at possible new therapies for stroke patients, up to 24 hours after stroke symptoms have started.

In the interest of saving time, some of the EMS actions, particularly the finer details of the history-taking and neurological evaluation, can be accomplished en route to the emergency center in the ambulance. The evaluation of the stroke patient, as with any patient, begins by performing a primary patient survey.

This includes:

- **Airway, Breathing and Circulation (ABC's):** In addition to the usual procedures, position the patient in a supine position, with the head and shoulders elevated to about 30 ° to promote venous drainage and reduce intracranial pressure (ICP). This position also assists the patient in controlling oral secretions and protects them from aspiration. Paralysis of the muscles of the throat, tongue, or mouth can lead to partial or complete upper-airway obstruction. Saliva can pool in the throat and be aspirated. The stroke patient may vomit, and aspiration of vomitus is a concern. Suction of the oropharynx and nasopharynx may be needed. Administer oxygen if the patient is experiencing hypoxia, oxygen SAT less than 95%. Administer O₂ by cannula at 2-3 L/min. Provide positive-pressure ventilation if ventilation is compromised. Advanced airway maneuvers when basic airway management is ineffective. Be aware that trauma may accompany a stroke patient if the patient fell. Always keep the stroke patient NPO, even if it seems like they can swallow.

Breathing – abnormal respirations are common in comatose patients and signal serious brain damage. Irregular respirations include prolonged pauses, Cheyne-Stokes respirations, or neurogenic hyperventilation. Shallow respirations or inadequate air exchange resulting from paralysis can occur. Rescue breathing, assisted ventilation and supplemental oxygen should begin promptly if needed. Severe brain injuries can lead to respiratory arrest.

Circulation – cardiac arrest is an uncommon complication of stroke, but assess for this early. Cardiac abnormalities are usually related to the development of perfusion arrhythmias or respiratory arrest. Arrhythmias and changes in blood pressure frequently complicate stroke, and monitoring of both BP and cardiac rhythm is part of the early assessments. Hypotension or shock is rarely caused by stroke, so if these clinical problems develop, look for other causes. Hypertension is often present in stroke patients, but it typically subsides and does not require treatment.

- Decisions about the treatment of increased BP should be made in the ED.

Cardiac arrhythmias may point to an underlying cardiac cause of stroke or may be a consequence of the stroke. Bradycardia may indicate hypoxia or ICP.

Other basic care of the stroke patient

- In the event severe stroke damage is indicated by increased ICP and decreased level of consciousness, some doctors may recommend hyperventilation to help reduce ICP. It is recommended that blood pressure not be treated in the field. Note that a rising blood pressure accompanied by a falling pulse rate is indicative of increased ICP, which requires intervention as described above and immediate transport to a hospital that specializes in caring for stroke patients.
- Handle the patient calmly, protect paralyzed extremities, keep patient inactive. Extreme activity can increase intracranial pressure. If trauma is suspected, establish and maintain cervical spine support.
- Perform a quick neurological exam using either the Cincinnati Pre-Hospital stroke scale or the Los Angeles Pre-Hospital stroke scale, but if time is an issue, perform this exam en route to the hospital.
- Keep patient warm, but not overly warm – hyperthermia can accelerate brain damage. Keep the patient NPO - do not give the patient anything to eat or

drink – paralysis of the pharynx is common and patients may have dysphagia (difficulty swallowing).

- Do not give stimulants and **do not give aspirin**.
- Do not treat high blood pressure in the field.
- Avoid hyperthermia (**keep patients cool, normothermic**), increased temperature can exacerbate ischemic brain damage.
- Quickly obtain relevant information from the patient (if capable), family, coworkers, friends or witnesses, including whether there has been trauma to the head and neck and ascertaining current medications use (including illegal drugs); ask about aspirin use to that antithrombotic effects may be anticipated. It is recommended that any medications that can be found at the location be collected and transported with the patient. If possible, have someone accompany the patient to the hospital or obtain their telephone number where they can be reached by EC personnel
- The secondary survey focuses on the neurological evaluation, during which the onset and progression of stroke symptoms must be determined and **document. Establish, as accurately as possible, the time of stroke onset**. You could ask questions such as:
 - Did the symptoms appear abruptly or gradually?
 - When was the patient last seen “normal” or without stroke symptoms?
 - What were you doing when the symptoms occurred?
 - Have any seizure like symptoms occurring during the event?

From the initial interaction with the patient, assess level of consciousness and orientation and, if the patient is conscious, any abnormalities in the patient’s speech. Use the Glasgow Coma Scale to record a baseline measurement to compare against future neurological deterioration during transport and when the patient arrives at the hospital.

- Establish an IV or saline lock, and infuse only normal saline at the “to keep open” rate. Do not administer large amounts of fluid, as it may exacerbate brain swelling.
- Measure blood glucose levels – hypoglycemia may mimic some of the symptoms of stroke. Do not administer dextrose fluids unless the glucose is less than 80.
- If one of the patient’s eyelids is affected, inform the patient first and loosely tape it closed to prevent drying of the eye.
- Transport to an emergency center that can properly care for stroke patients. Notify the “Stroke Team” directly if possible that there is a possible stroke patient en route and especially if the patient is a possible TPA candidate.
- Transport Code 3 or with the highest level of urgency to the most appropriate stroke facility.

Review of the “7 D’s” of the Chain of recovery for Acute Ischemic Stroke

1. Detection – Determine what the stroke symptoms are

- This pertains to the onset of stroke signs and symptoms.
- Less than 1 of 10 stroke victims has been educated about the signs and symptoms of stroke.
- Patients who have stroke do not usually feel pain (different from heart attack)
- Mild facial weakness, minor difficulty speaking or slight dizziness or nausea or vomiting, may be signs of stroke.
- More dramatic signs, including paralysis of a hand or arm, disabling vertigo, and loss of consciousness may be observed.

- Mild signs are often unnoticed or ignored.
- 2. **Dispatch – Early Activation of EMS**
 - Currently half of all stroke victims are driven to the ED by family or friends – they should call EMS instead
 - Emergent triage can begin with dispatch and bystanders can be instructed in lifesaving skills.
- 3. **Delivery** – excellent pre-hospital assessment, rapid transport (“Load and Go”) and great field management lead to correct identification of stroke and TIA’s.
 - Refer to signs and symptoms of stroke referred to previously.
 - Perform the Cincinnati Pre-hospital Stroke Screening Scale
 - Assess for facial droop – ask the patient to smile or show his or her teeth.
 - Motor arm drift – the patient closes his or her eyes and holds both arms out, look for drift or weakness on the affected side.
 - Speech difficulties – have the patient say “You can’t teach an old dog new tricks.”
 - Takes less than one minute
 - Patients with 1 out of 3 findings – as a new event – have a 72% chance of an ischemic stroke.
 - If all three findings are present, the chance of stroke becomes more than 85%!
 - You may also perform the Los Angeles Pre-hospital Stroke Screen
 - This screen adds age, history of seizures, symptoms duration, blood sugar levels, and lack of preexisting ambulation problems to 2 of the three signs of the Cincinnati Screen
- 4. **Door – ED Triage**
 - “Stroke Team” access if available
 - Time targets
 - Door to Doctor 10 minutes
 - Door to CT scan 25 minutes
 - Door to CT read 45 minutes
 - Door to treatment 60 minutes
- 5. **Data** – ED evaluation and management
- 6. **Decision** – specific stroke therapies
- 7. **Drugs** – fibrinolytic therapy – TPA!

Note: Stroke does occur in children. Pediatric patients by definition, under the age of 18 years. If stroke occurs in a child (under 18 years), the patient should be taken to a facility who can appropriately care for pediatric patients. Tissue plasminogen is indicated for patients 18 years and older. If tissue plasminogen activator is given to patients younger, this would be considered to be “off-label”.

VI. Conclusion

Stroke is a medical emergency. Time is brain! EMS personnel must know the signs and symptoms of stroke in order to properly triage and transport suspected stroke patients to a designated stroke hospital or center. Although, there is a 3 hour window in order to administer TPA, recent studies have shown that the earlier in the 3 hour window the patient receive TPA the

better the over all outcome. Some stroke centers have the capability of administering intra-arterial TPA in a 6 hour window and some others may have acute research studies for stroke patients as an alternative treatment if the patient falls out of the 3 hour treatment window for TPA.

References:

1. Case 10 AHA ACLS
2. 2005 AHA Stroke Statistics
3. Part 9: Adult Stroke, Circulation. 2005; 112:IV-III-IV-120.
4. Continuing Education for stroke SAFD/EMS 2003

Appendix – Inclusion/Exclusion Criteria for the administration of tissue plasminogen activator in acute ischemic stroke within 3 hours of symptoms onset.

Inclusion Criteria

1. Age 18 years and older
2. Onset of ischemic stroke symptoms (focal neurologic deficit (stroke symptoms) within the past 3 hours.
3. CT scan (computed tomography) normal with no evidence of intracranial hemorrhage or other cerebral pathology.

Exclusion Criteria

1. Rapidly improving or minor symptoms
2. Evidence of intracranial hemorrhage on pretreatment exam
3. History of intracranial hemorrhage
4. Suspicion of subarachnoid hemorrhage
5. Recent intracranial surgery or serious head trauma or recent previous stroke (<3 months)
6. Major surgery or serious trauma excluding head trauma in the previous 14 days
7. On repeated measurements, systolic blood pressure is >185 mmHg or diastolic blood pressure is >110 mmHg at the time treatment is to begin, and patients require aggressive treatment to reduce blood pressure to within these limits
8. Seizure at onset of stroke
9. Active internal bleeding
10. History of gastrointestinal or urinary tract hemorrhage within 21 days
11. Recent arterial puncture at a noncompressible site
12. Recent lumbar puncture
13. Intracranial neoplasm, arteriovenous malformation, or aneurysm
14. Known bleeding diathesis, including, but not limited to:
 - Current use of oral anticoagulants (e.g., warfarin sodium) or recent use with international normalized ratio (INR) >1.2
 - Administration of Heparin within 48 hours preceding the onset of the stroke or an elevated activated Partial Thromboplastin Time (aPTT) at presentation
 - Platelet count <100,000 mm³
15. Abnormal blood glucose (<50 or >400mg/dL)
16. Post myocardial infarction pericarditis

